The article examines interaction of economic, scientific and technical factors in quality management training including not only development of new approaches, but also design of integrated systems based on the principles of total quality management. In order to estimate efficiency of interdisciplinary projects, multi-criteria and multi-model approaches are considered essential.

Key words: quality management, integrated systems, total quality management, scientific and technical factors, economic factors, estimation of project efficiency, multi-criteria approach, multi-model approach.

By the end of the 20th century, people have come to understand that quality management rests on the strategies and tactics to achieve economic well-being of a certain employee and society in general. The 21st century was rightly called a Century of Quality by UNESCO. The current approaches to quality management do not only concern engineering process, but also direct and control an organization and society as a whole. In fact, quality is an integral notion that involves engineering, technical, economic, social, philosophical and other aspects, as well as their interaction. Today, quality management is of great importance as it is regarded as a strategy to improve economic efficiency within the international integration frame.

Different market processes stipulated the origin of various quality management systems based on the principles of Total quality management (TQM). The major toolboxes to enhance quality and productivity in business has been recently enriched by such approaches as Project Management, benchmarking (a method to compare key metrics), teaching organization theory, Balanced Scorecard, the concept of "6 sigma", Business Excellence, Total Productive Maintenance (TPM) [1, p. 82].

Managers of the companies have started to use more often various methods of analysis and problem solving which encourage and develop creativity. Benchmarking continues to grow in popularity and is used to enhance economic efficiency of organizations. Project management that allows creating flexible project-based and horizontal organizations also develops, though, not as rapidly as desired. Among the approaches that are likely to grow in popularity, Balanced Scorecard and Knowledge Management are worth mentioning. The requirement for a life-long learning has become an inevitable reality.

It is obvious that the basic concept of Scientific Management is directly dependent on the quality policy, which, in its turn, is the basis for effective implementation of other strategies of a company. Today, quality management is gradually becoming the key method to control and direct business, i.e. management of the fourth generation [2, p. 25].

The end of the 20th century witnessed a transition from "Mass production" to "Lean production". The beginning of the 21st century is viewed as a period of a new type manufacturing, called by a number of authors "Agile Manufacturing", Lean production, agile manufacturing, and simple use of process approach in line with the standards ISO 9000 can eliminate the borders, first of all, between organizations, then, between countries [3, p. 16].
The competitiveness of an enterprise can be definitely referred to a certain activity. It is proved by the fact that it covers various processes of product lifecycle and includes numerous methods, technologies, and design, analysis, and forecast techniques [4, p. 162-163].

Throughout the history of management theory and practice development, there is still debate on the importance of technical and humanitarian issues in management. The current conditions resulted from the need to facilitate the transfer to knowledge-intensive economy urge to solve this problem. Achieving a number of often conflicting goals, interaction of scientific, technical, and economic factors. Thus, search for the rational combination of technological and economic potential is a key task of quality management [5, p. 284].

Technological potential is secured by objective physical, biological, chemical, and humanitarian issues and economic factors. At any given time, the terminal parameter is defined by the gap between the achieved level of technical efficiency and the theoretical limit to the efficiency of the given technology. In addition, technical efficiency or technical level is defined on the basis of selected criteria and parameters. At any given time, the terminal parameter is defined by the gap between the achieved level of technical efficiency and the theoretical limit to the efficiency of the given technology.


Modern marketing has created a new type of competitiveness – intellectual capital competitiveness within the international frame. In the developed countries, the maximum growth of the national income is secured due to the forward-looking development of science, i.e. knowledge growth. The import of technologies is significant, but only more efficient than the import of products, while the import of intellectual capital is several times more efficient than import of technologies. Therefore, a number of developed countries focus on import of intellectual capital and professionalism making it a part of the state policy.

Modern quality management can be definitely referred to a certain activity. It is proved by the fact that it covers various processes of product lifecycle and includes numerous methods, technologies, and design, analysis, and forecast techniques [4, p. 162-163].

Throughout the history of management theory and practice development, there is still debate on the importance of technical and humanitarian issues in management. The current conditions resulted from the need to facilitate the transfer to knowledge-intensive economy urge to solve this problem. Achieving a number of often conflicting goals, interaction of scientific, technical, and economic factors. Thus, search for the rational combination of technological and economic potential is a key task of quality management [5, p. 284].

Technological potential is secured by objective physical, biological, chemical, and humanitarian issues and economic factors. At any given time, the terminal parameter is defined by the gap between the achieved level of technical efficiency and the theoretical limit to the efficiency of the given technology. In addition, technical efficiency or technical level is defined on the basis of selected criteria and parameters. At any given time, the terminal parameter is defined by the gap between the achieved level of technical efficiency and the theoretical limit to the efficiency of the given technology.


Modern marketing has created a new type of competitiveness – intellectual capital competitiveness within the international frame. In the developed countries, the maximum growth of the national income is secured due to the forward-looking development of science, i.e. knowledge growth. The import of technologies is significant, but only more efficient than the import of products, while the import of intellectual capital is several times more efficient than import of technologies. Therefore, a number of developed countries focus on import of intellectual capital and professionalism making it a part of the state policy.

The algorithm of finding the desired solution consists of a number of stages. Firstly, polymodel assessment of projects is performed in order to redefine the problem of optimizing the choice of the preferred project version in accordance with the relevant criteria and scientific, technical, and economic factors. The next stage is a multicriteria optimization of decision-making process. The stage involves the aggregation of criteria for project assessment and expert multi-criteria evaluation of alternative projects. A final decision on the choice of the preferred project is taken at the final stage of the algorithm.

The competitiveness of an enterprise can be definitely referred to a certain activity. It is proved by the fact that it covers various processes of product lifecycle and includes numerous methods, technologies, and design, analysis, and forecast techniques [4, p. 162-163].

Throughout the history of management theory and practice development, there is still debate on the importance of technical and humanitarian issues in management. The current conditions resulted from the need to facilitate the transfer to knowledge-intensive economy urge to solve this problem. Achieving a number of often conflicting goals, interaction of scientific, technical, and economic factors. Thus, search for the rational combination of technological and economic potential is a key task of quality management [5, p. 284].

Technological potential is secured by objective physical, biological, chemical, and humanitarian issues and economic factors. At any given time, the terminal parameter is defined by the gap between the achieved level of technical efficiency and the theoretical limit to the efficiency of the given technology. In addition, technical efficiency or technical level is defined on the basis of selected criteria and parameters. At any given time, the terminal parameter is defined by the gap between the achieved level of technical efficiency and the theoretical limit to the efficiency of the given technology.
Interdisciplinarity in Practice-Oriented Training of Bachelors in Line with the CDIO Initiative

Saint Petersburg Electrotechnical University “LETI”

A.M. Boronakhin, A.A. Minina, R.V. Shalymov

In the context of modern constantly changing realm the successfulness of technical HEIs’ graduates is determined not only by their current knowledge, but also by their ability to adapt to these changes. This article is devoted to the efforts of the Saint Petersburg Electrotechnical University “LETI” and namely the Faculty of Information Measurement and Biotechnical Systems (FIMBS) on implementing the CDIO Initiative approaches for development of the required students’ competences.

Key words: CDIO, engineering education, quality of education, interdisciplinarity, instrumentation technology.

One of the key factors influencing formation of specialists on any stage of educational process is the motivation of a student. Therefore, HEIs that want to increase the demand for their graduates have to pay significant attention to enrolling motivated school graduates, bachelor’s, master students, and PhDs. Throughout the study process all of these types of students have to have certain understanding of the connection between each step they make and the final result they can achieve; in this case, it is the successful employment [1, p. 166].

Working with school students

The introduction of a new enrollment procedure in Russian HEIs, which is based on the results of the Unified State Exam, has significantly changed the approach towards admission to university prospective students. Previously, in order to apply for studying at this university and faculty, and namely the Faculty of Information Measurement and Biotechnical Systems, students, who are interested in receiving engineering education in this field, had to come to an HEI, meet the Admission Board and exam administrators, which gave both enrollees and HEI an opportunity to get to know each other to some extent. However, the modern tendencies in education are deliberate and, moreover, foster extra activities for enrollees (Fig. 1).

The aim of this process is to get enrollees acquainted with peculiarities of studying at university and faculty, and to attract to enroll at LETI those prospective students, who are interested in receiving education in this field. By going through a consecutive set of events each prospective student will be able to choose his/her future educational path deliberately and, moreover, foster extra skills of communication, team work, as well we adapt to the upcoming learning process at an HEI [1, p. 167].

Features of educational process

The optimization of educational process that aims to increase the demand for graduates within the real sector of economy is a complex multifactor problem. The LETI Faculty of Information Measurement and Biotechnical Systems, when solving this problem, focused on the requirements of HEIs’ graduates within the real sector of economy, so the middle becomes perceptible only during the educational process itself. The solution to this problem is active interaction between an HEI and its prospective enrollees both in the city and in other regions or countries.

LETI, and the Faculty of Information Measurement and Biotechnical Systems in particular, spend significant financial and labor resources on career-guidance activities for enrollees (Fig. 1).

The optimization of educational process that aims to increase the demand for graduates within the real sector of economy is a complex multifactor problem. The LETI Faculty of Information Measurement and Biotechnical Systems, when solving this problem, focused on the requirements of HEIs’ graduates within the real sector of economy, so the middle becomes perceptible only during the educational process itself. The solution to this problem is active interaction between an HEI and its prospective enrollees both in the city and in other regions or countries.

LETI, and the Faculty of Information Measurement and Biotechnical Systems in particular, spend significant financial and labor resources on career-guidance activities for enrollees (Fig. 1).